Body Weight Dosing for Intravenous Anesthetic Infusions: Which One to Use?

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INTRODUCTION

Recorded and calculated body weights may differ substantially (Figure 1). This discrepancy can result in large differences in administered intravenous anesthetic medication intraoperatively; however, recommendations for weight selection are not readily available. We assessed the efficacy of a brief educational intervention that provided recommendations for weight-based dosing of intravenous anesthetic medications for adult patients.

MATERIALS AND METHODS

A survey was sent to anesthesia providers at an academic tertiary care hospital. First, participants were asked which body weight (total, ideal, or adjusted) they would select when dosing five intravenous anesthetic infusions: propofol, fentanyl, remifentanil, sufentanil, and ketamine. Participants also indicated their level of confidence in the accuracy of their answer choices (Figure 2). Participants were then shown an educational handout detailing a summary of recommendations from commonly used sources[1-17] utilizing experimental data and expert opinion (Figure 3). Finally, participants were asked to again indicate which body weight they would select when dosing the same five medications. Data was analyzed using McNemar's test at a 0.05 significance level.

RESULTS

In total, 61 individuals participated, including 30 faculty, 10 CRNAs, and 21 residents/fellows. For all medications assessed, most respondents were either neutral or agreed with the statement "I am confident about the accuracy of my answer choices" (Figure 4). The percentage increase in correct responses between pre and posttest questions (Figure 5) were 20% for propofol, 38% for fentanyl, 36% for sufentanil, 33% for remifentanil, and 23% for ketamine, respectively ($P < 0.01$).

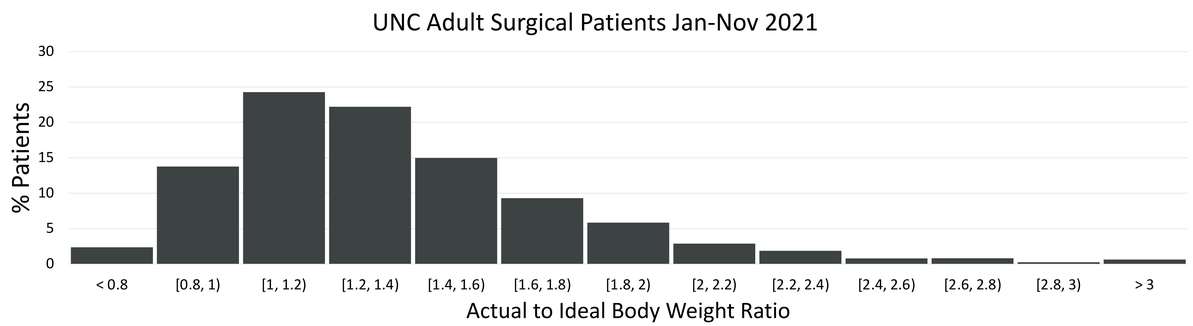

Figure 1: Actual to ideal body weight ratio of UNC adult surgical patients Jan-Nov 2021

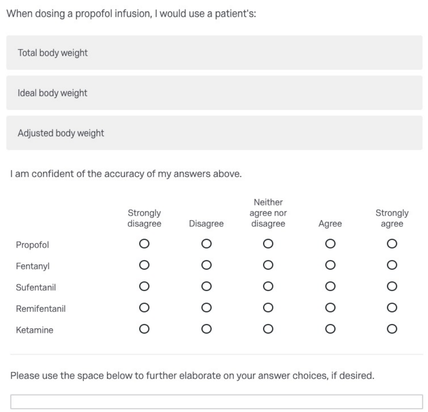

Figure 2: Examples of questions used in pretest

Figure 3: Summary graphic used in educational intervention

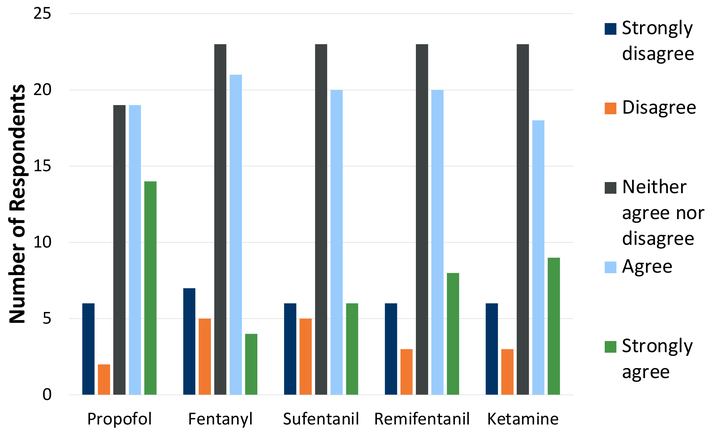

Figure 4: Responses to the statement "I am confident about the accuracy of my answer choices"

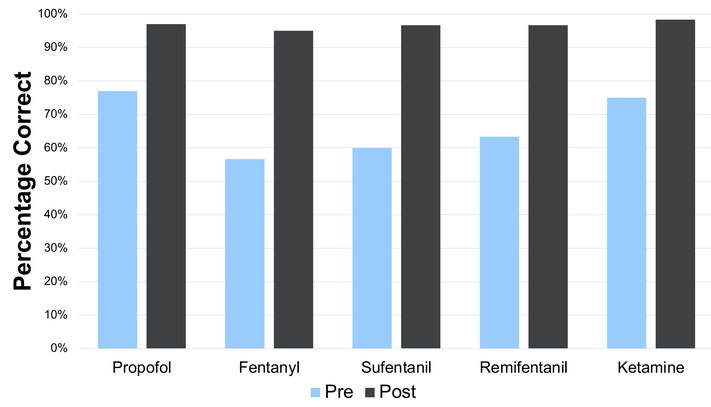

Figure 5: Pre and posttest results

CONCLUSION

A brief educational intervention improved participants' ability to select the recommended body weight for dosing intravenous anesthetic infusions. Departmental implementation of these recommendations would greatly decrease dosing uncertainty of these medications.

REFERENCES

1. DIPRIVAN (propofol) injectable emulsion, USP. Access Data. https://www.accessdata.fda.gov/ drugsatfda_docs/label/2017/019627s066lbl.pdf. Published April 2017. Accessed December 13, 2021.
2. Propofol (Lexi-Drugs). Lexicomp. http://www.crlonline.com/lco/action/doc/retrieve/docid/patch_f/7572?cesid=2JXn5llpJo7&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dpropofol%26t%3Dname%26va%3Dpropofol#doo. Published December 7, 2021. Accessed December 13, 2021.
3. Miller, R. D., Eriksson, L. I., Fleisher, L. A., Wiener-Kronish, J. P., Cohen, N. H., & Young, W. L. (2014). pg 891,2212. *Miller's Anesthesia*. London: Elsevier Health Sciences.
4. Butterworth IV JF, Mackey DC, Wasnick JD. eds. *Morgan & Mikhail's Clinical Anesthesiology, 6e*. McGraw Hill; 2018. Ch 7,9. Accessed December 02, 2021.https://accessanesthesiology.mhmedical.com/content.aspx?bookid=2444&sectionid=189634642
5. Cortínez LI, Anderson BJ, Penna A, Olivares L, Muñoz HR, Holford NH, Struys MM, Sepulveda P. Influence of obesity on propofol pharmacokinetics: derivation of a pharmacokinetic model. Br J Anaesth. 2010 Oct;105(4):448-56. doi: 10.1093/bja/aeq195. Epub 2010 Aug 14. PMID: 20710020.
6. Sufentanil: Sufentanil Citrate [prescribing information]. Lake Forest, IL: Akorn Inc; October 2019.
7. SUFentanil (Lexi-Drugs). Lexicomp. http://www.crlonline.com/lco/action/doc/retrieve/docid/patch_f/7709?cesid=38DQItenm0f&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dsufentanil%26t%3Dname%26va%3Dsufentanil#doo. Published December 7, 2021. Accessed December 13, 2021.
8. Schwartz AE, Matteo RS, Ornstein E, Young WL, Myers KJ. Pharmacokinetics of sufentanil in obese patients. Anesth Analg. 1991 Dec;73(6):790-3. PMID: 1835321.
9. Remifentanil: Reference ID: 4028196 - Food and Drug Administration. Access Data. https://www.accessdata. fda.gov/drugsatfda_docs/label/2016/020630s016lbl.pdf. Published December 2016. Accessed Dec 13, 2021.
10. Remifentanil (Lexi-Drugs). Lexicomp. http://www.crlonline.com/lco/action/doc/retrieve/docid/patch_f/7616?cesid=28QpvPymagv&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dremifentanil%26t%3Dname%26va%3Dremifentanil#doa. Published December 11, 2021. Accessed December 13, 2021.
11. Egan TD, Huizinga B, Gupta SK, Jaarsma RL, Sperry RJ, Yee JB, Muir KT; Remifentanil Pharmacokinetics in Obese versus Lean Patients. *Anesthesiology* 1998; 89:562–573. doi: https://doi.org/10.1097/00000542-199809000-00004.
12. Fentanyl: Reference ID: 4027953 - Food and Drug Administration. Access Data. https://www.accessdata.fda.gov/ drugsatfda_docs/label/2016/019115s030s031lbl.pdf. Published December 2016. Accessed December 13, 2021.
13. FentaNYL (Lexi-Drugs). Lexicomp. http://www.crlonline.com/lco/action/doc/retrieve/docid/patch_f/6903?cesid=2HQwaUBkwWq&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dfentanyl%26t%3Dname%26va%3Dfentanyl#doo. Published December 11, 2021. Accessed December 13, 2021.
14. Shibutani K, Inchiosa MA Jr, Sawada K, Bairamian M. Accuracy of pharmacokinetic models for predicting plasma fentanyl concentrations in lean and obese surgical patients: derivation of dosing weight ("pharmacokinetic mass"). Anesthesiology. 2004 Sep;101(3):603-13. doi: 10.1097/00000542-200409000-00008. PMID: 15329584.
15. Highlights of prescribing information these highlights do ... Access Data. https://www.accessdata.fda.gov/ drugsatfda_docs/label/2020/016812s046lbl.pdf. Published August 2020. Accessed December 13, 2021.
16. Erstad BL, Barletta JF. Drug dosing in the critically ill obese patient-a focus on sedation, analgesia, and delirium. Crit Care. 2020 Jun 8;24(1):315. doi: 10.1186/s13054-020-03040-z. PMID: 32513237; PMCID: PMC7282067.
17. Schumann R. Anesthesia for the obese patient. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. http://www.uptodate.com. Accessed Dec 01, 2021.